REMARKS

This is in response to the Office Action, dated October 17, 2002, where the Examiner has allowed claims 21-47 and rejected claims 7-11. Reconsideration and allowance of outstanding claims 7-11 in view of the following remarks are respectfully requested.

A. Rejection of Claims 7-11 Under 35 USC § 103(a)

The Examiner has rejected claims 7 and 10-11 under 35 USC § 103(a) as being unpatentable over **DeBoer et al.** (USPN 6,146,959) ("**DeBoer '959**") in view of **Takekawa et al.** (USPN 4,714,952) ("**Takekawa '952**"). The Examiner has further rejected claims 8 and 9 under 35 USC § 103(a) as being unpatentable over **DeBoer '959** in view of **Takekawa '952** as applied to claim 7 and further in view of **Catala et al.** (USPN 5,170,318) ("**Catala '318**"). Applicants respectfully disagree for the following reasons.

Pending claims 7-11 are directed to a capacitor structure comprising ceramic tantalum nitride. The present invention, as defined by independent claim 7, teaches "a structure comprising: a first capacitor electrode; a second capacitor electrode; a dielectric comprising ceramic tantalum nitride situated between said first and second capacitor electrodes." As disclosed and taught in the present application, ceramic tantalum nitride is a form of tantalum nitride in an amorphous ceramic mode. The fabrication of ceramic tantalum nitride, as disclosed in detail in the present application, results in a form of tantalum nitride exhibiting different properties than the well-known form of tantalum

nitride fabricated in the metallic mode. For example, in the ceramic mode, tantalum nitride exhibits a high resistivity and a high dielectric constant, which allows the present invention to utilize fabricated ceramic tantalum nitride as a dielectric to advantageously achieve a capacitor having a relatively high capacitance density. See, for example, page 10, lines 10-15; page 12, lines 16-20; and page 14, lines 4-6 in the present application. Furthermore, as disclosed in the present application, the present invention's capacitor can be advantageously fabricated in a single ionized metal plasma ("IMP") tool without having to remove the semiconductor wafer from the IMP tool for fabrication of a dielectric layer comprising ceramic tantalum nitride.

With regard to independent claim 7, **DeBoer '959** fails to disclose, teach or suggest the above recited limitations specified by claim 7. **DeBoer '959** is directed to a capacitor utilizing tantalum pentoxide as a dielectric. **DeBoer '959** specifically discloses a first tantalum-comprising layer 38 preferably comprising Ta_2O_5, i.e. tantalum pentoxide, which is used as a dielectric layer. See, for example, **DeBoer '959**, column 3, lines 62-64. **DeBoer '959** further discloses second tantalum-comprising layer 40, which is used as a barrier layer, preferably comprising tantalum and nitrogen, formed over first tantalum-comprising layer 38. See, for example, column 4, lines 5-9 and Figure 3 of **DeBoer '959**. Thus, in **DeBoer '959**, tantalum and nitrogen, e.g. Ta_2N or $Ta_xO_yN_z$, are utilized to form a barrier layer, i.e. second tantalum-comprising layer 40, and not a dielectric layer. In **DeBoer '959**, metal nitride layer 42 is formed over second tantalum-comprising layer 40. See, for example, column 4, lines 65-66 and Figure 4 of **DeBoer '959**.

In **DeBoer '959**, metal nitride layer 42 can be formed by a conventional CVD process. Thus, in **DeBoer '959**, second tantalum-comprising layer 40 prevents carbon present from the CVD process from diffusing into first tantalum-comprising layer 38. See, for example, **DeBoer '959**, column 5, lines 3-9. Thus, **DeBoer '959** teaches a barrier layer comprising tantalum and nitrogen, i.e. second tantalum-comprising layer 40, protecting a dielectric layer made from tantalum pentoxide, i.e. first tantalum-comprising layer 38, from carbon diffusion resulting from the formation of metal nitride layer 42 by a CVD process. The barrier layer comprising tantalum and nitrogen of **DeBoer '959**, i.e. second tantalum-comprising layer 40, is not used as a dielectric layer.

In a second embodiment, **DeBoer '959** also teaches use of second tantalum-comprising layer 40 as a barrier layer between second capacitor plate 50 and the Ta_2O_5 of layer 38 to prevent undesirable formation of silicon dioxide. See, for example, column 5, lines 15-24 and Figure 5 of **DeBoer '959**. Thus, the barrier layer comprising tantalum and nitrogen of **DeBoer '959**, i.e. second tantalum-comprising layer 40, is not used as a dielectric layer.

In contrast, the present invention as recited in claim 7 includes "a dielectric comprising ceramic tantalum nitride." For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by independent claim 7, is not suggested, disclosed, or taught by **DeBoer '959**. As such, the present invention, as defined by independent claim 7, is patentably distinguishable over **DeBoer '959**.

The basic deficiencies of **DeBoer '959** are not remedied by the disclosure of **Takekawa '952** because **Takekawa '952** fails to disclose or suggest a capacitor including "a dielectric comprising ceramic tantalum nitride." According to the Examiner, in column 18, lines 36-38, i.e. in dependent claim 6, **Takekawa '952** claims a capacitor wherein the "dielectric material is selected from the group consisting of silicon nitride, tantalum nitride, and boron nitride." As such, **Takekawa '952** simply recites a list of "nitrides" to be used as dielectrics. However, **Takekawa '952** does not teach, disclose or suggest, how ceramic tantalum nitride, in particular, can be fabricated and used in a capacitor as taught, disclosed, and claimed in the present invention. For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by independent claim 7, is not suggested, disclosed, or taught by **Takekawa '952**. As such, the present invention, as defined by independent claim 7, is patentably distinguishable over **Takekawa '952**.

Moreover, Applicants respectfully submit that a person of ordinary skill in the art would not combine **DeBoer '959** with **Takekawa '952** as suggested by the Examiner because the suggested combination would render the apparatus of **DeBoer '959** inoperative and/or meaningless. The capacitor of **DeBoer '959** includes a dielectric layer, i.e. first tantalum-comprising layer 38, preferably comprising tantalum pentoxide and a barrier layer, i.e. second tantalum-comprising layer 40, preferably comprising tantalum and nitrogen, formed over the dielectric layer. In **DeBoer '959**, the barrier layer prevents carbon present from a CVD process from diffusing into the dielectric layer and prevents

undesirable formation of silicon dioxide between second capacitor plate 50 and the dielectric layer. Combining the non-ceramic tantalum nitride of **Takekawa '952** with the dielectric layer of **DeBoer '959** results in a capacitor having a dielectric layer and a barrier layer comprising identical or substantially similar materials, i.e. tantalum and nitrogen. Thus, contrary to the teachings **DeBoer '959**, these layers, i.e. the dielectric layer and the barrier layer, form a single layer of material comprising tantalum and nitrogen. Therefore, Applicants respectfully submit that a person of ordinary skill in the art would not combine **DeBoer '959** with **Takekawa '952** because the suggested combination would be contrary to the objectives of the apparatus of **DeBoer '959**. Specifically, the barrier layer would not prevent carbon present from a CVD process from diffusing into the dielectric layer or prevent undesirable formation of silicon dioxide between second capacitor plate 50 and the dielectric layer because the barrier layer and the dielectric layer would form a single layer comprising tantalum and nitrogen.

Therefore, neither **DeBoer '959** nor **Takekawa '952**, alone or in combination, result in the present invention as recited in independent claim 7 because **DeBoer '959** and **Takekawa '952**, alone or in combination, fail to disclose or remotely suggest to disclose or suggest a capacitor including "a dielectric layer comprising ceramic tantalum nitride." As discussed above, the present invention, as defined by independent claim 7, is patentably distinguishable over **DeBoer '959** and **Takekawa '952**. Thus, dependent claims 8-11 of independent claim 7 are also patentable for at least the reasons discussed above in relation to independent claim 7, and also due to the added limitations in

dependent claims 8-11. Therefore, Applicants respectfully submit that rejection of independent claim 7 has been traversed, and its corresponding dependent claims 8-11 should now be allowed.

The Examiner has further rejected claims 8 and 9 under 35 USC 103(a) as being unpatentable over **DeBoer '959** in view of **Takekawa '952** and in further view of **Catala '318**. As discussed above, independent claim 7 is patentably distinguishable over **DeBoer '959** in view of **Takekawa '952** and, as such, claims 8 and 9 are, *a fortiori*, also patentably distinguishable over **DeBoer '959** in view of **Takekawa '952**. Moveover, the features of independent claim 7, for example a dielectric comprising ceramic tantalum nitride situated between a first and second capacitor electrode, are not suggested, disclosed, or taught anywhere in **Catala '318**. As such, independent claim 7 as well as claims 8 and 9 depending therefrom are also patentably distinguishable over **DeBoer '959** in view of **Takekawa '952** and in further view **Catala '318**.

B. Conclusion

For all the foregoing reasons, an early allowance of claims 7-11 in the present application is respectfully requested. As such, an early Notice of Allowance directed to claims 7-11 and 21-47 remaining in the present application is respectfully requested.

Respectfully Submitted,
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